

NEW HOLLAND 216

REPAIR MANUAL



216 REPAIR MANUAL CONTENTS

SECTION 00 - GENERAL INFORMATION
SECTION 35 - HYDRAULIC SYSTEMS
SECTION 39 - FRAMES
SECTION 44 - WHEEL AND AXLE
SECTION 55 - ELECTRICAL SYSTEM
SECTION 90 - DECALS

The sections used through out all New Holland product Repair manuals may not be used for each product. Each Repair manual will be made up of one or several books.

The sections listed above are the sections utilized for the 216 Rake.

SECTION 00 - GENERAL INFORMATION

Chapter 1 - General Information

CONTENTS

Section	Description	Page
	Foreword	2
	Precautionary Statements	3
	Personal Safety	3
	Machine Safety	3
	Hardware Torque Values	5
	Installation of Adjustable Fittings In Straight Thread O Ring Bosses	8
	Standard Torque Data for Hydraulic Tubes and Fittings	8
	Pipe Thread Fitting Torque	9
	Installation of ORFS (O Ring Flat Faced) Fittings	9
	Ecology and the Environment	10
	International Symbols	11
	General Features	12
	Tractor Hydraulic Requirements	12
	Trailing Lights	12
	Attaching to the Tractor	13
	Rake Controls	14
	Control Box Operation	15

FOREWORD

Appropriate service methods and correct repair procedures are essential for the safe, reliable operation of all equipment, as well as the personal safety of the individual performing the repair.

This Repair Manual provides troubleshooting and overhaul instructions using recommended procedures and equipment. Following these instructions will ensure the safe, efficient, and timely completion of the service or repair.

The manual is divided into sections which are subdivided into chapters. Each chapter contains information on general operating principals, details inspection, overhaul and, where applicable, specific troubleshooting, special tools, and specifications.

Any reference in this manual to right, left, rear, front, top, or bottom is determined by standing behind the machine and looking in the direction of travel.

All data and illustrations in this manual are subject to variations in build specification. This information was correct at the time of issue, but New Holland policy is one of continuous improvement, and the right to change specification, equipment, or design at any time, without notice, is reserved.

PRECAUTIONARY STATEMENTS

PERSONAL SAFETY

Throughout this manual and on machine decals, you will find precautionary statements (“**DANGER**”, “**WARNING**”, and “**CAUTION**”) followed by specific instructions. These precautions are intended for the personal safety of you and those working with you. Please take the time to read them.



DANGER



This word “**DANGER**” indicates an immediate hazardous situation that, if not avoided, will result in death or serious injury. The color associated with Danger is RED.



WARNING



This word “**WARNING**” indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury. The color associated with Warning is ORANGE.



CAUTION



This word “**CAUTION**” indicates a potentially hazardous situation that, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices. The color associated with Caution is YELLOW.

FAILURE TO FOLLOW THE “DANGER”, “WARNING”, AND “CAUTION” INSTRUCTIONS MAY RESULT IN SERIOUS BODILY INJURY OR DEATH.

MACHINE SAFETY

The precautionary statement (“**IMPORTANT**”) is followed by specific instructions. This statement is intended for machine safety.

IMPORTANT: *The word “IMPORTANT” is used to inform the reader of something he needs to know to prevent minor machine damage if a certain procedure is not followed.*

INFORMATION

NOTE: *Instructions used to identify and present supplementary information.*

SAFETY

PRECAUTIONARY STATEMENTS

A careful operator is the best operator. Most accidents can be avoided by observing certain precautions. To help prevent accidents, read the following precautions before operating this equipment. Equipment should be operated only by those who are responsible and instructed to do so.

Carefully review the procedures given in this manual with all operators. It is important that all operators be familiar with and follow safety precautions.

SAFETY PRECAUTIONS

1. **Always lock the tractor brakes and shut off the tractor engine before:**
 - Leaving the tractor seat.
 - Lubricating.
 - Cleaning or unplugging any part of the rake.
 - Adjusting the rake.
2. **Do not attempt to lubricate or perform any maintenance while any part of the rake frame or baskets is in motion or if the tractor is running.**
3. **Do not work under the baskets when they are in the raised position unless they are properly blocked.**
4. **Fluid under pressure can have sufficient force to penetrate the skin, causing serious personal injury. Always protect the skin and eyes from escaping fluid under pressure. Before disconnecting lines or fittings, be sure to release all pressure by operating the tractor control valves. Before applying pressure to the system, be sure all connections are tight and that hoses and connections are not damaged. If injured by escaping fluid, obtain medical assistance at once. Serious infection or reaction can develop if medical treatment is not administered immediately.**
5. **Do not start the tractor until you know that everyone is clear of the rake and have made sure no tools are lying on it.**
6. **Never work around the rake in loose clothing that could catch in a moving part.**
7. **Do not attempt to manually unplug or remove any material while the rake is in operation or if the tractor engine is running.**
8. **Never permit anyone to ride on the rake. Keep all bystanders away when the rake is operating in the field or if the rake hydraulic system is engaged.**
9. **Always use adequate lights and safety warning devices when transporting the rake on public roads or after dark. Check with your local law enforcement agencies for specific requirements.**
10. **Limit transport speeds to 32 km/hr (20 MPH) maximum.**
11. **Never stand near the rake while it is running.**
12. **Use of the optional safety chain is recommended when operating on a public road.**
13. **Do not weld on wheels. Welding on wheels may cause high stress and a wheel failure.**
14. **Do not weld on wheels with a mounted tire. Welding on wheels with a mounted tire may cause the tire to burst, causing serious injury or death.**

HARDWARE TORQUE VALUES

Using the following Hardware Torque Charts, torque all hardware to the specified torque unless otherwise specified within the instructions.

IMPORTANT: *Be sure to use the hardware specified when using tapped holes because installing a metric bolt in an inch thread or an inch bolt in a metric thread will damage the threads.*

Observe the following when installing hardware:

- Install flat washers over all slotted holes unless truss-head or carriage bolts are used.
- Install special hardened washers where specified.
- Install a lock washer on all bolts unless a jam nut or self-locking nut is specified.

MINIMUM HARDWARE TIGHTENING TORQUES

IN FOOT POUNDS (NEWTON-METERS) FOR NORMAL ASSEMBLY APPLICATIONS

INCH HARDWARE AND LOCKNUTS

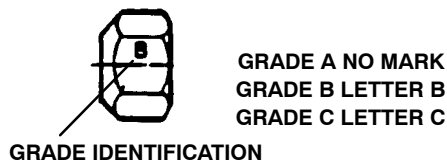
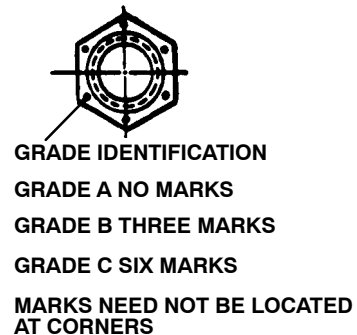
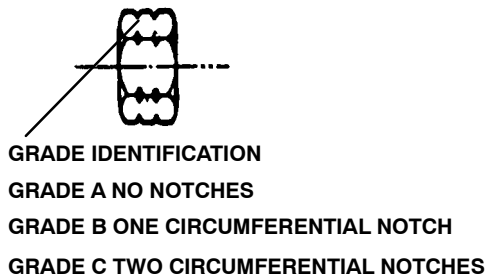
NOMINAL SIZE	SAE GRADE 2		SAE GRADE 5		SAE GRADE 8		LOCKNUTS		NOMINAL SIZE
	UNPLATED or PLATED SILVER	PLATED W/ZnCr GOLD	UNPLATED or PLATED SILVER	PLATED W/ZnCr GOLD	UNPLATED or PLATED SILVER	PLATED W/ZnCr GOLD	GR.B w/GR5 BOLT	GR.C w/GR8 BOLT	
1/4	55* (6.2)	72* (8.1)	86* (9.7)	112* (13)	121* (14)	157* (18)	61* (6.9)	86* (9.8)	1/4
5/16	115* (13)	149* (17)	178* (20)	229* (26)	250* (28)	324* (37)	125* (14)	176* (20)	5/16
3/8	17 (23)	22 (30)	26 (35)	34 (46)	37 (50)	48 (65)	19 (26)	26 (35)	3/8
7/16	27 (37)	35 (47)	42 (57)	54 (73)	59 (80)	77 (104)	30 (41)	42 (57)	7/16
1/2	42 (57)	54 (73)	64 (87)	83 (113)	91 (123)	117 (159)	45 (61)	64 (88)	1/2
9/16	60 (81)	77 (104)	92 (125)	120 (163)	130 (176)	169 (229)	65 (88)	92 (125)	9/16
5/8	83 (112)	107 (145)	128 (174)	165 (224)	180 (244)	233 (316)	90 (122)	127 (172)	5/8
3/4	146 (198)	189 (256)	226 (306)	293 (397)	319 (432)	413 (560)	160 (217)	226 (306)	3/4
7/8	142 (193)	183 (248)	365 (495)	473 (641)	515 (698)	667 (904)	258 (350)	364 (494)	7/8
1	213 (289)	275 (373)	547 (742)	708 (960)	773 (1048)	1000 (1356)	386 (523)	545 (739)	1

NOTE: Torque values shown with * are inch pounds.

IDENTIFICATION CAP SCREWS AND CARRIAGE BOLTS



LOCKNUTS



MINIMUM HARDWARE TIGHTENING TORQUES

IN FOOT POUNDS (NEWTON-METERS) FOR NORMAL ASSEMBLY APPLICATIONS

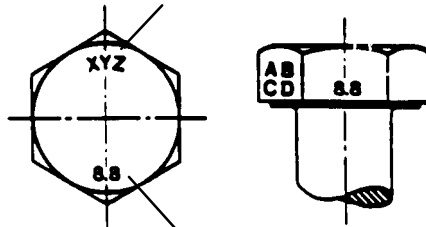
METRIC HARDWARE AND LOCKNUTS

NOMINAL SIZE	CLASS 5.8		CLASS 8.8		CLASS 10.9		LOCKNUT CL.8 W/CL8.8 BOLT
	UNPLATED	PLATED W/ZnCr	UNPLATED	PLATED W/ZnCr	UNPLATED	PLATED W/ZnCr	
M4	15* (1.7)	19* (2.2)	23* (2.6)	30* (3.4)	33* (3.7)	42* (4.8)	16* (1.8)
M6	51* (5.8)	67* (7.6)	79* (8.9)	102* (12)	115* (13)	150* (17)	56* (6.3)
M8	124* (14)	159* (18)	195* (22)	248* (28)	274* (31)	354* (40)	133* (15)
M10	21 (28)	27 (36)	32 (43)	41 (56)	45 (61)	58 (79)	22 (30)
M12	36 (49)	46 (63)	55 (75)	72 (97)	79 (107)	102 (138)	39 (53)
M16	89 (121)	117 (158)	137 (186)	177 (240)	196 (266)	254 (344)	97 (131)
M20	175 (237)	226 (307)	277 (375)	358 (485)	383 (519)	495 (671)	195 (265)
M24	303 (411)	392 (531)	478 (648)	619 (839)	662 (897)	855 (1160)	338 (458)

NOTE: Torque values shown with * are inch pounds.

IDENTIFICATION HEX CAP SCREW AND CARRIAGE BOLTS CLASSES 5.6 AND UP

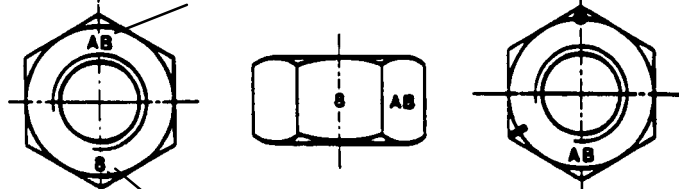
MANUFACTURER'S IDENTIFICATION



PROPERTY CLASS

HEX NUTS AND LOCKNUTS CLASSES 05 AND UP

MANUFACTURER'S IDENTIFICATION



PROPERTY CLASS

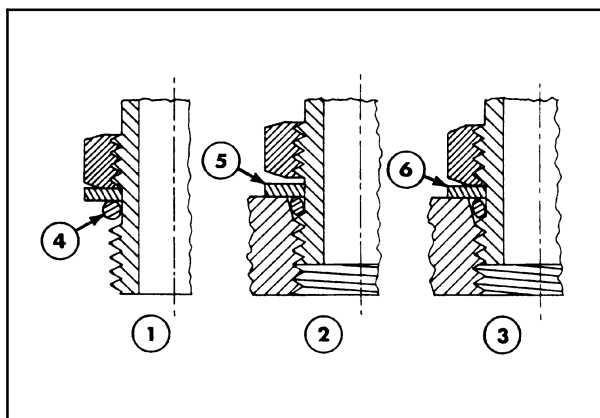
CLOCK MARKING

INSTALLATION OF ADJUSTABLE FITTINGS IN STRAIGHT THREAD O RING BOSSES

1. Lubricate the O ring by coating it with a light oil or petroleum. Install the O ring in the groove adjacent to the metal backup washer which is assembled at the extreme end of the groove, 4.
2. Install the fitting into the SAE straight thread boss until the metal backup washer contacts the face of the boss, 5.

NOTE: Do not over tighten and distort the metal backup washer.

3. Position the fitting by turning out (counterclockwise) up to a maximum of one turn. Holding the pad of the fitting with a wrench, tighten the locknut and washer against the face of the boss, 6.



1

STANDARD TORQUE DATA FOR HYDRAULIC TUBES AND FITTINGS

SIZE	TUBING OD		THREAD SIZE	TORQUE				O RING BOSS PLUGS ADJUSTABLE FITTING LOCKNUTS, SWIVEL JIC - 37° SEATS			
	mm	In.		NEWTON METERS		FOOT POUNDS		NEWTON METERS		FOOT POUNDS	
				Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
4	6.4	1/4	7/16-20	12	16	9	12	8	14	6	10
5	7.9	5/16	1/2-20	16	20	12	15	14	20	10	15
6	9.5	3/8	9/16-18	29	33	21	24	20	27	15	20
8	12.7	1/2	3/4-18	47	54	35	40	34	41	25	30
10	15.9	5/8	7/8-14	72	79	53	53	47	54	35	40
12	19.1	3/4	1-1/16-12	104	111	77	82	81	95	60	70
14	22.2	7/8	1-3/16-12	122	136	90	100	95	109	70	80
16	25.4	1	1-5/16-12	149	163	110	120	108	122	80	90
20	31.8	1-1/4	1-5/8-12	190	204	140	150	129	158	95	115
24	38.1	1-1/2	1-7/8-12	217	237	160	175	163	190	120	140
32	50.8	2	2-1/2-12	305	325	225	240	339	407	250	300

These torques are not recommended for tubes of 12.7 mm (1/2") OD and larger with wall thickness of 0.889 mm (0.035") or less. The torque is specified for 0.889 mm (0.035") wall tubes on each application individually.

solvent or Loctite cleaner and apply hydraulic sealant Loctite no. 569 to the 37° flare and the threads.

Install fitting and torque to specified torque, loosen fitting and retorque to specifications.

Before installing and torquing 37° flared fittings, clean the face of the flare and threads with a clean

PIPE THREAD FITTING TORQUE

Before installing and tightening pipe fittings, clean the threads with a clean solvent or Loctite cleaner and apply sealant Loctite no. 567 for all fittings including stainless steel or no. 565 for most metal fittings. For high filtration/zero contamination systems use no. 545.

THREAD SIZE	TORQUE (MAXIMUM)
1/8" - 27	13 N·m (10 ft lbs)
1/4" - 18	16 N·m (12 ft lbs)
3/8" - 14	22 N·m (16 ft lbs)
1/2" - 14	41 N·m (30 ft lbs)
3/4" - 14	54 N·m (40 ft lbs)

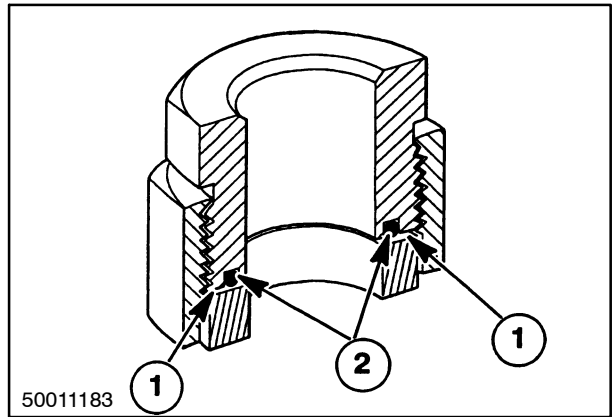
INSTALLATION OF ORFS (O RING FLAT FACED) FITTINGS

When installing ORFS fittings thoroughly clean both flat surfaces of the fitting, 1, and lubricate the O ring, 2, with light oil. Make sure both surfaces are aligned properly. Torque the fitting to specified torque listed throughout the repair manual.

IMPORTANT: *If the fitting surfaces are not properly cleaned, the O ring will not seal properly. If the fitting surfaces are not properly aligned, the fittings may be damaged and will not seal properly.*

IMPORTANT: *Always use genuine factory replacement oils and filters to ensure proper lubrication and filtration of engine and hydraulic system oils.*

The use of proper oils, grease, and keeping the hydraulic system clean will extend machine and component life.



ECOLOGY AND THE ENVIRONMENT

Soil, air, and water are vital factors of agriculture and life in general. When legislation does not yet rule the treatment of some of the substances which are required by advanced technology, common sense should govern the use and disposal of products of a chemical and petrochemical nature.

The following are recommendations which may be of assistance:




































- Become acquainted with and ensure that you understand the relative legislation applicable to your country.
- Where no legislation exists, obtain information from suppliers of oils, filters, batteries, fuels, antifreeze, cleaning agents, etc., with regard to their effect on man and nature and how to safely store, use and dispose of these substances. Agricultural consultants will, in many cases, be able to help you as well.

HELPFUL HINTS

1. Avoid filling tanks using cans or inappropriate pressurized fuel delivery systems which may cause considerable spillage.
2. In general, avoid skin contact with all fuels, oils, acids, solvents, etc. Most of them contain substances which may be harmful to your health.
3. Modern oils contain additives. Do not burn contaminated fuels and or waste oils in ordinary heating systems.
4. Avoid spillage when draining off used engine coolant mixtures, engine, gearbox and hydraulic oils, brake fluids, etc. Do not mix drained brake fluids or fuels with lubricants. Store them safely until they can be disposed of in a proper way to comply with local legislation and available resources.
5. Modern coolant mixtures, i.e. antifreeze and other additives, should be replaced every two years. They should not be allowed to get into the soil but should be collected and disposed of safely.
6. Do not open the air-conditioning system yourself. It contains gases which should not be released into the atmosphere. Your dealer or air conditioning specialist has a special extractor for this purpose and will have to recharge the system properly.
7. Repair any leaks or defects in the engine cooling or hydraulic system immediately.
8. Do not increase the pressure in a pressurized circuit as this may lead to a component failure.
9. Protect hoses during welding as penetrating weld splatter may burn a hole or weaken them, allowing the loss of oils, coolant, etc.

INTERNATIONAL SYMBOLS

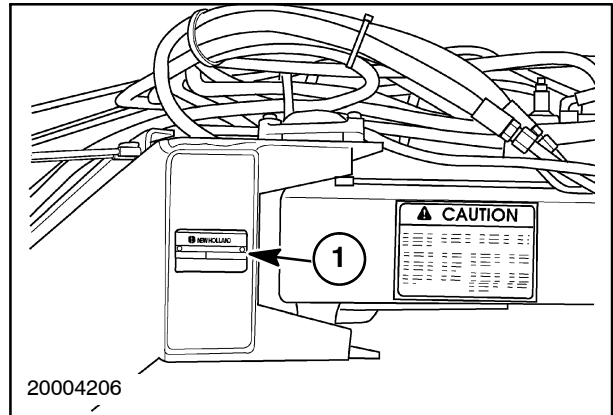
As a guide to the operation of your tractor, various universal symbols have been utilized on the instruments, controls, switches, and fuse box. The symbols are shown below with an indication of their meaning.

	Thermostart starting aid		Radio		P.T.O.		Position Control
	Alternator charge		Keep alive memory		Transmission in neutral		Draft Control
	Fuel level		Turn signals		Creeper gears		Accessory socket
	Automatic Fuel shut-off		Turn signals -one trailer		Slow or low setting		Implement socket
	Engine speed (rev/min x 100)		Turn signals -two trailers		Fast or high setting		%age slip
	Hours recorded		Front wind-screen wash/wipe		Ground speed		Hitch raise (rear)
	Engine oil pressure		Rear wind-screen wash/wipe		Differential lock		Hitch lower (rear)
	Engine coolant temperature		Heater temperature control		Rear axle oil temperature		Hitch height limit (rear)
	Coolant level		Heater fan		Transmission oil pressure		Hitch height limit (front)
	Tractor lights		Air conditioner		FWD engaged		Hitch disabled
	Headlamp main beam		Air filter blocked		FWD disengaged		Hydraulic and transmission filters
	Headlamp dipped beam		Parking brake		Warning!		Remote valve extend
	Work lamps		Brake fluid level		Hazard warning lights		Remote valve retract
	Stop lamps		Trailer brake		Variable control		Remote valve float
	Horn		Roof beacon		Pressurized! Open carefully		Malfunction! See Operator's Manual
			Warning! Corrosive substance				Malfunction! (alternative symbol) See Operator's Manual

GENERAL FEATURES

On this equipment, left and right are determined by standing behind the unit, looking in the direction of travel.

The model and serial number of the rake are stamped on an identification tag, 1, on the left side of the left swing frame.



3

TRACTOR HYDRAULIC REQUIREMENTS

The tractor should have a hydraulic system capable of pumping a minimum of 34 L/min. (9 gallons per minute) with 13,780 kPa (2000 PSI) relief setting for satisfactory performance.

The tractor should have two remote outlets.

One circuit operates the basket reels and is also used to position the rake baskets and wheels.

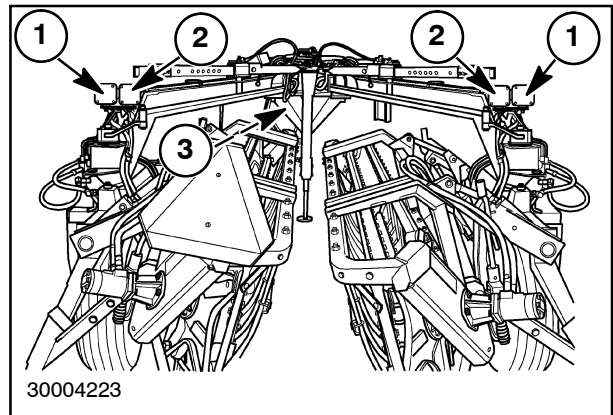
The other circuit is used to raise and lower the rake baskets.

TRAILING LIGHTS

The trailing lights as shown should be used when towing the rake on a public road. Refer to your local codes for light requirements.

The trailing lights consist of two amber flashing lights, 1, and two red tail/brake lights, 2, attached to the mainframe, and a lighting control box, 3, positioned on the tongue that controls the signals from the tractor to the mower-conditioner.

This lighting system is intended to improve the machine visibility on public roads and warn operators of other vehicles of your actions. This machine is equipped with a lighting system which conforms to ASAE S279.10.

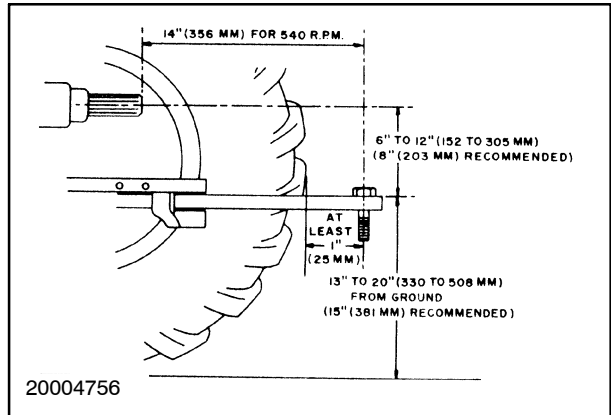


4

ATTACHING TO THE TRACTOR

Adjust the drawbar to meet the ASAE standard specifications as shown. If possible, make sure the drawbar is at least 381 mm (15") high. On some tractors with an offset drawbar it may be necessary to turn the drawbar over.

Locate the drawbar directly underneath the tractor PTO shaft and secure the drawbar so it cannot move side to side.



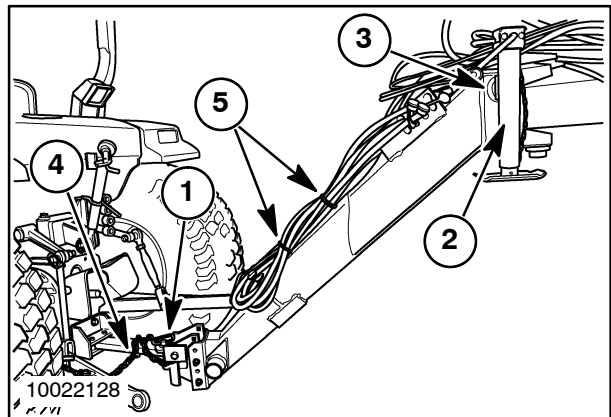
5

Hitch and Jack

Attach the rake hitch to a tractor drawbar as shown and install a hitch pin, 1, that can be securely fastened. Move the jack, 2, to its storage location, 3.

Attach the safety chain, 4, to the tractor. The safety chain is recommended when operating on a public road to keep the machine under control in the event of loss or failure of the hitch pin or bolt.

Remove the cable ties, 5, from the hoses.



6

Hydraulic Hoses and Electrical Harness

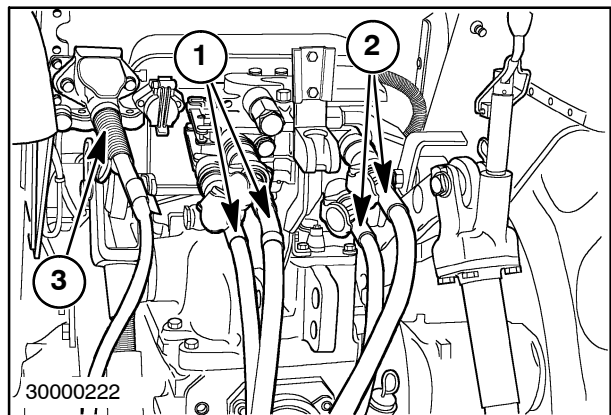
Connect the hydraulic hoses to the tractor remote outlets.

The 3/8" ID hoses, 1, are used to raise and lower the baskets.

The 1/2" ID hoses, 2, are used to operate the reel hydraulic motors and also operate the shift and steering cylinders.

The four hoses on the rake are shipped with standard type quick disconnect couplers installed on the 1/2" pipe threads on the hose fittings. It may be necessary to replace them with different couplers to match the tractor remote outlets. Attach the hoses to the tractor remote outlets as shown.

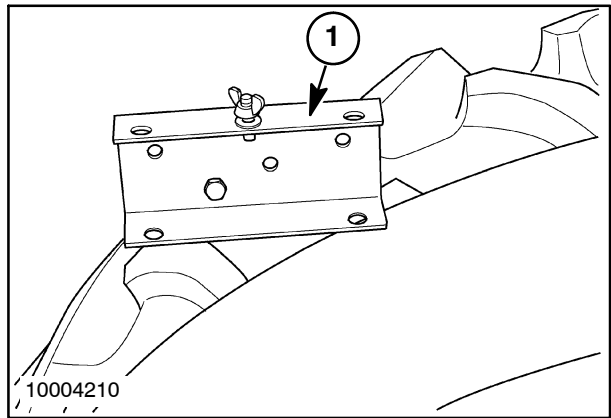
Connect the 7-pin electric plug, 3, to the tractor's implement receptacle.



7

Rake Control Box

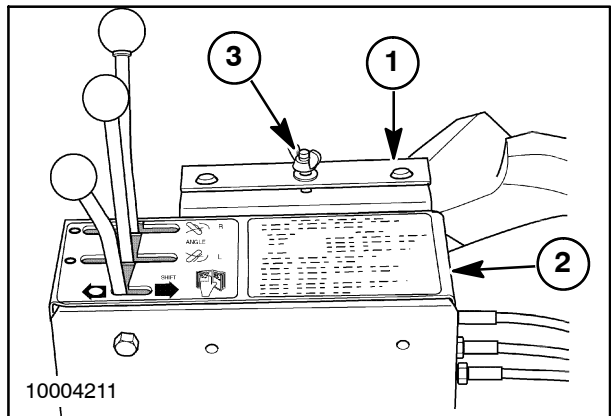
Mount the rake control box bracket, 1, at a convenient location on the tractor. The control box bracket is shown attached to a custom-made bracket. The mounting bracket may also be bolted directly to the tractor fender or cab.



8

Attach the control box, 2, to the mounting channel, 1. Secure the control box to the bracket using latch 3.

NOTE: Remove the control box from the mounting channel and place it on the rake before the rake is unhitched from the tractor.

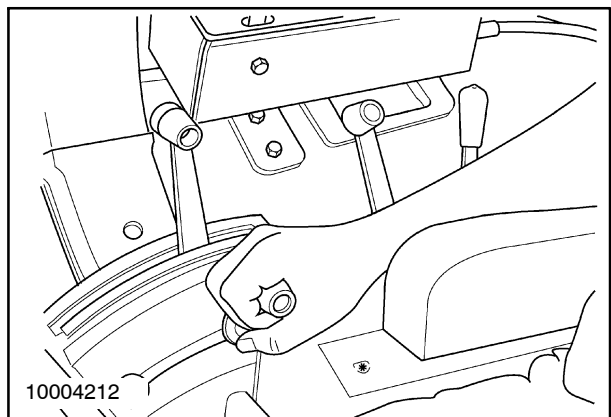


9

RAKE CONTROLS

Basket Lift

The baskets are raised and lowered using the tractor remote outlet control lever on the tractor.

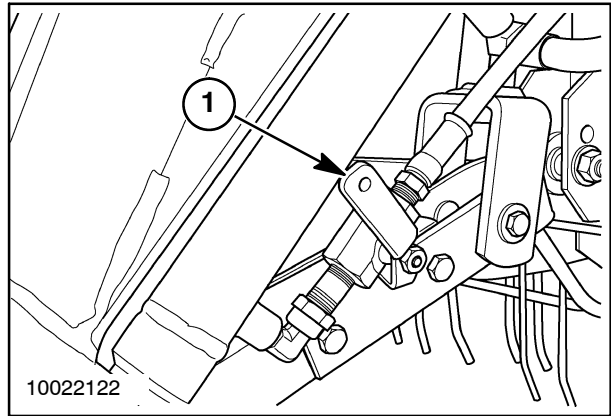


10

Basket Lift Transport Lock

Shutoff valves, 1, connected to each rake basket lift cylinder can be closed to hold each basket up. The valve, 1, is shown in the closed position. Turn the handle parallel to the valve body to open the valve.

- Open both valves to allow the baskets to go down to the operating position when the tractor remote valve is moved to the "lower" position.
- Raise the baskets and close one valve to hold one basket up, while raking with the other basket.
- Raise the baskets and close both valves to hold the baskets up when transporting the rake.



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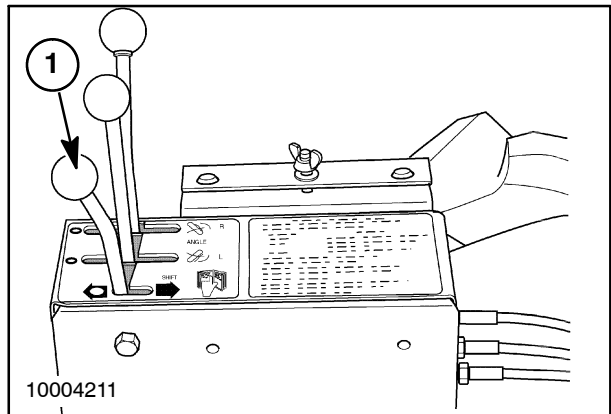
11

CONTROL BOX OPERATION

Left Lever Operation

The left lever, 1, is used to select either RAKE or SHIFT.

- When the RAKE position is selected, the basket reel motors will operate when the tractor remote lever is moved to the "lower" position.
- When the SHIFT position is selected, the tractor remote lever is used to control the wheel and basket swing cylinders.



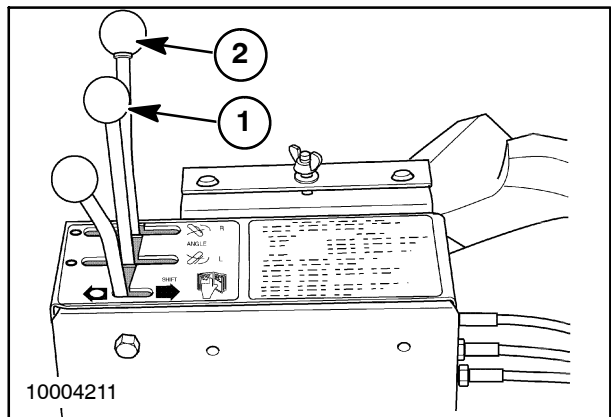
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12

Center and Right Lever Operation

The center, 1, and right, 2, levers are used to select between the RAKE, WHEEL, and ANGLE functions. The center lever, 1, is used to control the cylinders on the left side of the rake, and the right lever, 2, is used to control the cylinders on the right side of the rake.

- All three levers must be in the center, RAKE, position for the basket reel motors to operate properly.
- When the center and right levers are moved forward to select the WHEEL function and the left lever is in the shift position, moving the tractor remote outlet control lever will reposition the wheels so that when the rake is moved forward the swing frames will move together or so that when the rake is moved rearward the swing frames will move apart between the transport and operating positions.
- When the center and right levers are moved rearward to select the ANGLE function and the left lever is in the shift position, moving the tractor remote outlet control lever will reposition the baskets.



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13

SECTION 00 - GENERAL INFORMATION

Chapter 2 - Lubrication

CONTENTS

Section	Description	Page
	Lubrication	2
	Recommended Lubricants and Coolants	2
	Lubrication Schedule	3
	Lubrication Fittings	4

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